

Specification

CONNECTION SYSTEM FOR CONNECTING AT LEAST ONE CONTACT OF AT LEAST ONE FLAT BLOCK OF COMPONENTS TO AT LEAST ONE APPARATUS

The present invention relates to a connection system for connecting at least one contact of at least one flat block of components to at least one apparatus having the characteristics of the preamble to independent claim 1 and to a flat block of components having the characteristics of the preamble to independent claim 8 as well as to an apparatus having the characteristics of the preamble to independent claim 14.

Thus the present invention relates to a connection system for connecting at least one contact of at least one flat block of components to at least one apparatus, which system has a conductive connecting element, connected electrically conductively to the at least one contact of the flat block of components, and a clamping device connected electrically conductively to the apparatus, and the clamping device is embodied to receive the connecting element and thus, via the connecting element, to make an electrically conductive connection between the apparatus and the contact of the flat block of components. The invention thus furthermore pertains to a corresponding flat block of components and a corresponding contact.

A connection system of this kind is typically realized by means of a cable harness, so that typically the conductive connecting element comprises individual conductors of the cable harness that are insulated from one another.

When cable harnesses are used, it is disadvantageous that many individual conductors have to be connected. As a result, there is a great risk that individual conductors will be transposed, and as a result incorrect electrical connections are made and short circuits can be caused.

From US Patent 6,036,508 A, an electrical connection device is known, having a first end that is disposed with some motion play on a flat block of components, and a second end, which has a bush for receiving a bolt of a conductor busbar. This electrical connection device is intended as an adapter between the conductor busbar on the one hand and the flat block of components on the other, so that by the play of motion of this adapter relative to the flat block of components to compensate for a production variation or a thermal misfit.

From International Patent Disclosure WO 02/089260 A, a connection device is known by which electrical power can be transferred from a first flat block of components to a second flat block of components; this connection device includes a first line element in which a second line element is disposed. The first and second line elements, in one embodiment, are embodied in the form of cylinders located coaxially to one another, which with their respective ends are each in electrical contact with a respective one of the first and second flat blocks of components; the first and second flat blocks of components are held together, with the disposition of the first and second cylinders between them, by a screw located coaxially to them.

From US Patent 5,411,418 A, a combination of a flat block of components that has many holes, a connection device that borders on the flat block of components and has an insulator with leadthroughs that are aligned with the holes of the flat block of components, and many contacting means that are each connected by a solder-free press fit to a respective one of the holes in the flat block of components and are each disposed with another portion in a respective one of the leadthroughs of the insulator.

From US Patent 4,812,130 A, a flat block of components with a conductive connection part is known; the connection part includes a shoulder part which contacts a surface of the flat block of components and a lower part that is widened such that it contacts a conductive coating, which adjoins an opening in the flat block of components on the diametrically opposed surface of the flat block of components. As a result, the flat block of components is as it were clamped in place between the shoulder part and the lower part of the connection part. In one embodiment, the connection part has a prong which can be inserted into a plug in order to make an electrical connection.

From US Patent 6,066,006 A, an apparatus with a flat block of components is known on which a conductor busbar is secured by means of many electrically conductive fastening means. The fastening means are embodied in particular in the form of prongs disposed on the flat block of components that each have a thread to which the conductor busbar is screwed to nuts in order to make an electrical as well as a mechanical connection with the prongs; as a result of the screwing operation, the conductor busbar is as it were mechanically clamped between the flat block of components on the one hand and the nut on the other.

It is therefore the object of the present invention to make a connection system for connecting at least one contact of at least one flat block of components to at least one apparatus available in which the transposition of connecting elements can be reliably avoided, and the connection system generally has an especially simple, sturdy construction. It is a further object of the present invention to make a corresponding flat block of components and a corresponding apparatus available.

In a connection system having the characteristics of the preamble to claim 1, this object is attained by the characteristics of the body of independent claim 1. In the case of a flat block of components having the characteristics of the preamble to independent claim 15, this object is attained by the characteristics of the body of independent claim 15.

Because the connecting element is embodied as a rigid conductor connected to the flat block of components, confusing the conductor with another conductor and thus making incorrect wiring is precluded. Moreover, plugs and fastening material for the flat block of components can be dispensed with, since the flat block of components can be retained by the clamping device directly via the rigid conductor of the connecting element. Because the connecting element engages the clamping device of the apparatus directly, a compact construction of the connection system is furthermore attained.

The rigid conductor forming the connecting element is a screw fastened electrically conductively directly to the contact of the flat block of components. The screw, with a shaft having a thread, penetrates a bore made in the flat block of components in the region of the contact, and the screw is locked via a nut on a second side of the flat block of components diametrically opposite a first side of the flat block of components.

Such a construction has especially great stability.

In the particularly preferred embodiment, it is also advantageous if the head of the screw comes into electrical contact with the contact on the first side of the flat block of components, and/or the nut of the screw comes into electrical contact with the contact on the second side of the flat block of components, because in this way an electrical connection between the contact and the connecting element can be established especially easily.

For further improvement of the electrical contact or for easier installation of the screw and nut, it can furthermore be advantageous if the head and/or the nut of the screw is soldered or welded to the contact.

In a further embodiment of the present invention, it is advantageous if the flat block of components is an assembled printed circuit board.

In this case, preferably one or more rectifiers for one or more inverters of a magnetic resonance gradient amplifier are disposed on the printed circuit board and are connected to one or more associated apparatuses via one or more connecting elements and one or more clamping devices.

In general, it is advantageous if the at least one clamping device of the at least one apparatus

is furnished directly on the at least one apparatus or via one or more separate ...